

# Database with country-specific automation risk assessments for occupations

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## Deliverable D1.1

Database with country-specific automation risk assessments for occupations

Version 1.0

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#### TECHNEQUALITY partners

ROA Universiteit Maastricht

TiU Stichting Katholieke Universiteit Brabant

UOXF The Chancellor, Masters and Scholars of the University of Oxford

CE Cambridge Econometrics Ltd.

SOFI Stockholms University

WZB Wissenschaftszentrum Berlin für Sozialforschung GGGmbH

EUI European University Institute

TU Tallinn University

#### Description of deliverable (100 words)

In Autumn 2019, we conducted a survey among experts who are knowledgeable about the tasks that are performed in occupations. The aim of this survey was to assess experts' opinion of the future importance of tasks in these occupations given the current state of technology. The survey covers the occupations in the 2008 International Standard Classification of Occupations (ISCO) in eight countries. The data gathered through this survey can be used to generate country-specific automation risk assessments for occupations at the 2-digit level of ISCO. The automation risk indicators can be used to assess the impact of technological developments on labour markets in Europe.

## 1. Survey on automation risk

In Autumn 2019, we fielded a questionnaire among experts to gather data on country-specific automation risk assessments for occupations at the 2-digit level of the International Standard Classification of Occupations (ISCO) 2008.<sup>1</sup> The data from the survey can be used to derive automation risk indicators that could help quantify the impact of technological developments on labour markets in Europe.

A number of studies have predicted the extent to which jobs are susceptible to automation (see, e.g., Frey & Osborne, 2017<sup>2</sup>; Nedelkoska & Quintini, 2018<sup>3</sup>). The estimates produced by previous studies rely on an expert assessment of the type of tasks that are (still) difficult to automate given the current state of technology. Based on the task composition of jobs, such so-called engineering bottlenecks are used to determine the automation risk in occupations. However, the fact that certain job tasks are automatable does not automatically imply that jobs will actually be automated. This is because many factors (e.g., price and access to technology, legislation, availability of training data and also managerial practices and culture) constrain the adoption and diffusion of technologies (Levels et al., 2019<sup>4</sup>).

Professionals who are experts on tasks that are performed in specific occupational groups have been requested to give their opinion on their expectation with respect to the time that workers in occupations spend on tasks that characterize their occupation. Respondents have been explicitly asked to take into account factors that influence the actual adoption of technologies when giving their assessment. The advantage of this is that automation risk indicators that can be derived from the data are not purely based on the automation *potential* of tasks. Another advantage of our data is that it reflects experts' view for a variety of EU countries.

## 2. Survey design

### 2.1 Target population

The target population for the survey comprised professionals who are knowledgeable about the tasks that are performed within specific (or a variety of) occupational groups according to the ISCO classification. The target population included owners or directors of companies and HR professionals. The sample was restricted to respondents who are at least 30 years old to ensure that they would have enough work experience to develop a sound judgement about how automation affects the time that workers spend on performing occupation-specific tasks.

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<sup>1</sup> A complete description of the ISCO 2008 can be found on the following website:

<https://www.ilo.org/public/english/bureau/stat/isco/isco08/>

<sup>2</sup> Frey, C. B., & Osborne, M. A. (2017). The future of employment: How susceptible are jobs to computerisation? *Technological forecasting and social change*, 114, 254-280.

<sup>3</sup> Nedelkoska, L., & Quintini, G. (2018). *Automation, skills use and training*. OECD Social, Employment and Migration Working Papers, No. 202. OECD Publishing, Paris.

<sup>4</sup> Levels, M., Fregin, M.C. & Somers, M. (2019). The implications of technological change for the workforce: A scenario study. *Technequality Working Paper*.

Professionals in all sectors and company sizes could participate in the survey. In view of the relatively small base per country, random samples were drawn.

Due to budgetary restrictions, the survey was rolled out in 8 European countries that vary in their socio-economic and institutional structure:

- Germany
- Estonia
- France
- Great Britain
- The Netherlands
- Norway
- Spain
- Czech Republic

## *2.2. Approach target population*

The survey was designed by us (Section 2.3) and disseminated by Kantar Public. For the fieldwork in the Netherlands, Kantar used the Kantar NIPObase Business panel. This panel includes professionals in the commercial and non-profit sector who are in decision-making positions. The database includes information on the precise responsibilities of individuals in the panel and about their organisation. Members of the panel have indicated that they are willing to participate in business-to-business research. The data collection took place via the Internet (computer-assisted web interviewing, CAWI). Respondents received a small remuneration for their participation. A target sample was drawn and subsequently invited via e-mail.

For the fieldwork outside the Netherlands, various local panels were used in each country. The data collection in the other countries also took place via the Internet (CAWI). The way in which respondents were approached differs across the local panels. In some panels, a broad sample of respondents was invited. In other panels, surveys are accessible in a portal, where respondents can log in and fill in questionnaires that are suitable for them. In all panels, quotas were used. As soon as the minimum response target was reached, the questionnaire could no longer be accessed. The minimum target was n=100 respondents per country.

## *2.3 Questionnaire*

The questionnaire mainly included close-ended questions. The complete survey can be found in the Appendix. In the questionnaire, respondents were asked to select occupations for which they are knowledgeable based on the ISCO classification and to report about their expectation with changes in the time that workers spend on occupation-specific tasks in the next five years given the most recent technological developments.

Before respondents provided their assessment on the importance of tasks, they were asked to select a set of occupations they are knowledgeable about and for which they would like to give their opinion. To guide respondents in the selection of occupations, a stepwise approach was used based on the ISCO-2008 classification. In total, the ISCO-2008 classification consists of 433 occupations (at the 4-digit level). Respondents were first asked to select one major occupational group (there are 9 major groups at the 1-digit level), and subsequently, one of the underlying sub-major groups (there are 40 sub-major groups at the 2-digit level). Within the selected sub-major group, respondents were allowed to select multiple unit groups (there are 433 unit groups at the 4-digit level). After assessing the changes in tasks for a specific occupation, respondents were offered the opportunity to assess another occupation. For costs reasons, we maximised this possibility such that respondents did not exceed a maximum survey time of 15 minutes.

To ensure a realistic assessment by experts, we refer them to the most detailed level of tasks at the 4-digit ISCO level. The tasks are taken from the ISCO handbook. For each of these occupation-specific tasks we asked respondents to provide their opinion on the future change in time that workers spend on the tasks in the next five years.<sup>5</sup> The following question was used:

*“Based on the most recent technological developments (e.g., in the fields of robotics, computerization, machine learning), could you indicate how much time workers will spend on the following tasks for the occupation of [selected occupation] in the next five years?”*

*Please take into account factors that influence the actual adoption of technologies when providing your answer (i.e., the price of technologies; the design of the organisation, production processes and supply chains; legal constraints; and cultural expectations).”*

Respondents indicated the future importance of each task by selecting one of the following answer categories: 1) workers will not perform this task any longer, 2) workers will spend less time on this task, 3) workers will spend the same amount of time on this task, 4) workers will spend more time on this task, or 5) I don’t know.

Once respondents provided their opinion for the selected occupations, respondents were asked whether they wanted to assess additional occupations. If they indicated that they wanted to do so, they could make a selection from the remaining occupations. The maximum amount of occupations for which respondents could provide their assessment was five.

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<sup>5</sup> On average, a unit occupational group contains 8 tasks in the ISCO description.

The questionnaire included questions on respondents' occupation, gender and age. The final part of the questionnaire included two questions that reflect respondents' view on technological innovations.<sup>6</sup>

*“Due to the use of robots and artificial intelligence, more jobs will disappear than new jobs will be created.”*

*“Robots are necessary as they can do jobs that are too hard or too dangerous for people.”*

Respondents were asked to indicate to what extent they agree or disagree with the statements by selecting one of the following answer categories: 1) totally agree, 2) tend to agree, 3) tend to disagree, 4) totally disagree, or 5) I don't know.

The questionnaire included routings such that the respondents are only provided with the relevant questions. The questionnaire was developed by the Research Centre for Education and the Labour Market (ROA) and programmed by Kantar Public. The translation of tasks at the ISCO 4-digit was provided to us by Prof. Kea Tijdens and were developed as part of the H2020 SERISS (Synergies for Europe's Research Infrastructures in the Social Sciences) project. Kantar Public provided the country specific translations of the invitation text, and other survey questions.

### 3. Fieldwork and response

The fieldwork took place between October 15<sup>th</sup> and 27<sup>th</sup>, 2019. The average duration for completing the survey was 8 minutes. Table 1 shows the timing of the field work and the response in each country.

**Table 1: Net response by country and field work period**

Country	Net response	Starting date	End date	Average duration survey
Germany	104	15-10-2019	17-10-2019	6
Estonia	101	17-10-2019	22-10-2019	10
France	139	15-10-2019	17-10-2019	7
Great-Britain	100	15-10-2019	18-10-2019	7
The Netherlands	132	21-10-2019	27-10-2019	8
Norway	107	15-10-2019	21-10-2019	7
Spain	170	15-10-2019	17-10-2019	8
Czech Republic	111	16-10-2019	23-10-2019	8
Total	964	15-10-2019	27-10-2019	8

<sup>6</sup> The questions are retrieved from the Special Eurobarometer 460, a survey conducted by TNS opinion & social at the request of the European Commission.

Table 2 shows the number of respondents per country and sub-major occupational group. The highest coverage is observed for the major group managers (ISCO codes 11 – 14). The lowest coverage is observed for the major groups “Plant and Machine Operators and Assemblers” (ISCO codes 81-83) and “Elementary Occupations” (ISCO codes 91 – 96).



**Table 2: Occupational coverage by country**

Sub-major occupation	ISCO code	Germany	Estonia	France	Great Britain	The Netherlands	Norway	Spain	Czech Republic	Total
Chief Executives, Senior officials and Legislators	11	14	6	12	14	3	9	17	6	81
Administrative and Commercial Managers	12	13	9	12	13	14	11	21	15	108
Production and Specialized Services Managers	13	17	20	18	7	14	13	19	11	119
Hospitality, Retail and Other Services Managers	14	1	10	4	9	8	3	2	5	42
Science and Engineering Professionals	21	1	3	3	5	2	5	2	2	23
Health Professionals	22	1	1	7	4	11	7	4	0	35
Teaching Professionals	23	5	0	3	2	5	7	2	1	25
Business and Administration Professionals	24	3	3	8	9	5	3	8	1	40
Information and Communications Technology Professionals	25	3	2	4	4	2	0	3	2	20
Legal, Social and Cultural Professionals	26	4	2	2	4	4	1	12	3	32
Science and Engineering Associate Professionals	31	1	4	8	0	2	0	3	6	24
Health Associate Professionals	32	0	1	1	1	1	0	1	0	5
Business and Administration Associate Professionals	33	0	3	2	0	0	0	3	3	11

Table 2 (continued)										
Sub-major occupation	ISCO code	Germany	Estonia	France	Great Britain	The Netherlands	Norway	Spain	Czech Republic	Total
Legal, Social, Cultural and Related Associate Professionals	34	0	0	0	0	0	0	2	0	2
Information and Communications Technicians	35	2	0	1	0	4	3	4	4	18
General and Keyboard Clerks	41	1	0	8	3	14	4	5	5	40
Customer Services Clerks	42	1	2	0	2	3	1	10	0	19
Numerical and Material Recording Clerks	43	0	0	6	0	2	3	5	1	17
Other Clerical Support Workers	44	2	1	6	1	4	0	6	0	20
Personal Services Workers	51	3	1	6	2	3	3	4	9	31
Sales Workers	52	7	12	8	3	9	7	9	9	64
Personal Care Workers	53	3	1	4	1	3	0	2	1	15
Protective Services Workers	54	0	0	0	1	1	1	1	0	4
Market-oriented Skilled Agricultural Workers	61	1	3	1	1	2	1	3	1	13
Market-oriented Skilled Forestry, Fishery and Hunting workers	62	0	0	0	0	0	1	0	1	2
Subsistence Farmers, Fishers, Hunters and Gatherers	63	2	0	0	0	1	0	1	1	5
Building and Related Trades Workers (excluding Electricians)	71	0	1	2	2	3	4	4	5	21

Table 2 (continued)

Sub-major occupation	ISCO code	Germany	Estonia	France	Great Britain	The Netherlands	Norway	Spain	Czech Republic	Total
Metal, Machinery and Related Trades Workers	72	0	2	0	0	0	1	2	4	9
Handicraft and Printing Workers	73	3	0	0	2	2	0	0	3	10
Electrical and Electronic Trades Workers	74	0	1	0	0	0	0	1	1	3
Food Processing, Woodworking, Garment and Other Craft and Related Trades Workers	75	3	1	0	0	1	4	2	1	12
Stationary Plant and Machine Operators	81	0	3	0	0	1	1	2	0	7
Assemblers	82	0	1	0	1	0	0	0	2	4
Drivers and Mobile Plant Operators	83	0	0	0	0	2	1	0	1	4
Cleaners and Helpers	91	0	0	1	1	0	2	0	0	4
Agricultural, Forestry and Fishery Labourers	92	0	0	0	1	0	0	0	0	1
Labourers in Mining, Construction, Manufacturing and Transport	93	1	2	1	1	0	0	1	1	7
Food Preparation Assistants	94	0	0	1	0	0	0	2	0	3
Street and Related Sales and Services Workers	95	0	0	0	1	0	0	1	0	2
Refuse Workers and Other Elementary Workers	96	0	0	0	0	0	1	0	0	1
<b>Total</b>		92	95	129	95	126	97	164	105	903

## Appendix – Overview of the survey

Q007 - VBJ: DUMMY: Country		Single coded
Not back   Dummy		
Normal		
1	Czech Republic	
2	Germany	
3	Great Britain	
4	Spain	
5	France	
6	Netherlands	
7	Norway	
8	Estonia	

  

Q012 - VBP:	Text
Not back	
<p>Welcome to this survey.</p> <p>In this survey, we would like to hear your opinion on the extent to which the tasks that people perform in their occupations change due to recent technological innovations. We would like your opinion for 5 occupations you are most familiar with. This will take about 15 minutes of your time.</p>	

  

Ask only if NOT Q007 - VBJ,6	
B004 - BBF: Screener block	Begin block

  

Q011 - VBN: Occupation		Single coded
Not back		
What is your occupation?		
Normal		
1	HR professional	
2	Firm owner	

3 Manager

4 Other

 [GO TO SCREEN OUT](#)

Q010 - VBM: Gender

Single coded

Not back

Are you ...?

Please select the answer that applies

Normal

1 Male

2 Female

Q009 - VBL: Age

Numeric

Not back | Min = 18 | Max = 99

What is your age?

B004 - BBF: Screener block

End block

B001 - BBB: Occupation selection

Begin block

Q001 - VBB: Major occupation

Single coded

Below, we ask you to select for which occupations you would like to provide your opinion. In total, there are 433 occupations. To guide you in this selection, we will first show you the overarching major (9) and underlying sub-major (40) occupational groups. You will then be able to choose specific occupations. You will be given the opportunity to give your opinion for multiple occupations.

Please indicate for which **major** occupational group you would like to give your opinion.

Normal

1 Managers

- Managers plan, direct, coordinate and evaluate the overall activities of enterprises, governments and other organizations, or of organizational units within them, and formulate and review their policies, laws, rules and regulations.*
- 2 Professionals
- Professionals increase the existing stock of knowledge; apply scientific or artistic concepts and theories; teach about the foregoing in a systematic manner; or engage in any combination of these activities.*
- 3 Technicians and Associate Professionals
- Technicians and associate professionals perform technical and related tasks connected with research and the application of scientific or artistic concepts and operational methods, and government or business regulations.*
- 4 Clerical Support Workers
- Clerical support workers record, organize, store, compute and retrieve information, and perform a number of clerical duties in connection with money-handling operations, travel arrangements, requests for information, and appointments.*
- 5 Services and Sales Workers
- Services and sales workers provide personal and protective services related to travel, housekeeping, catering, personal care, protection against fire and unlawful acts; or demonstrate and sell goods in wholesale or retail shops and similar establishments, as well as at stalls and on markets.*
- 6 Skilled Agricultural, Forestry and Fishery Workers
- Skilled agricultural, forestry and fishery workers grow and harvest field or tree and shrub crops; gather wild fruits and plants; breed, tend or hunt animals; produce a variety of animal husbandry products; cultivate, conserve and exploit forests; breed or catch fish; and cultivate or gather other forms of aquatic life in order to provide food, shelter and income for themselves and their households.*
- 7 Craft and Related Trades Workers
- Craft and related trades workers apply specific technical and practical knowledge and skills to construct and maintain buildings; form metal; erect metal structures; set machine tools or make, fit, maintain and repair machinery, equipment or tools; carry out printing work; and produce or process foodstuffs, textiles, wooden, metal and other articles, including handicraft goods.*
- 8 Plant and Machine Operators and Assemblers

*Plant and machine operators and assemblers operate and monitor industrial and agricultural machinery and equipment on the spot or by remote control; drive and operate trains, motor vehicles and mobile machinery and equipment; or assemble products from component parts according to strict specifications and procedures.*

9 Elementary Occupations

*Elementary occupations involve the performance of simple and routine tasks which may require the use of hand-held tools and considerable physical effort.*

10 I do not want to provide my opinion for any other occupational group(s)

Q002 - VBC: sub-major occupation

Single coded

Please indicate for which **sub-major** occupational group you would like to give your opinion.

Random

11 Chief Executives, Senior Officials and Legislators

12 Administrative and Commercial Managers

13 Production and Specialized Services Managers

14 Hospitality, Retail and Other Services Managers

21 Science and Engineering Professionals

22 Health Professionals

23 Teaching Professionals

24 Business and Administration Professionals

25 Information and Communications Technology Professionals

26 Legal, Social and Cultural Professionals

31 Science and Engineering Associate Professionals

32 Health Associate Professionals

33 Business and Administration Associate Professionals

34 Legal, Social, Cultural and Related Associate Professionals

35 Information and Communications Technicians

41 General and Keyboard Clerks

42	Customer Services Clerks
43	Numerical and Material Recording Clerks
44	Other Clerical Support Workers
51	Personal Services Workers
52	Sales Workers
53	Personal Care Workers
54	Protective Services Workers
61	Market-oriented Skilled Agricultural Workers
62	Market-oriented Skilled Forestry, Fishery and Hunting Workers
63	Subsistence Farmers, Fishers, Hunters and Gatherers
71	Building and Related Trades Workers (excluding Electricians)
72	Metal, Machinery and Related Trades Workers
73	Handicraft and Printing Workers
74	Electrical and Electronic Trades Workers
75	Food Processing, Woodworking, Garment and Other Craft and Related Trades Workers
81	Stationary Plant and Machine Operators
82	Assemblers
83	Drivers and Mobile Plant Operators
91	Cleaners and Helpers
92	Agricultural, Forestry and Fishery Labourers
93	Labourers in Mining, Construction, Manufacturing and Transport
94	Food Preparation Assistants
95	Street and Related Sales and Services Workers
96	Refuse Workers and Other Elementary Workers



Q003 - VBD: Occupation selection

Multi coded

Min = 1 | Max = 5

Please indicate for which occupation(s) you would like to give your opinion.

You can select multiple occupational groups.

Random

- 1111 Legislators
- 1112 Senior Government Officials
- 1113 Traditional Chiefs and Heads of Villages
- 1114 Senior Officials of Special-interest Organizations
- 1120 Managing Directors and Chief Executives
- 1211 Finance Managers
- 1212 Human Resource Managers
- 1213 Policy and Planning Managers
- 1219 Business Services and Administration Managers Not Elsewhere Classified
- 1221 Sales and Marketing Managers
- 1222 Advertising and Public Relations Managers
- 1223 Research and Development Managers
- 1311 Agricultural and Forestry Production Managers
- 1312 Aquaculture and Fisheries Production Managers
- 1321 Manufacturing Managers
- 1322 Mining Managers
- 1323 Construction Managers
- 1324 Supply, Distribution and Related Managers
- 1330 Information and Communications Technology Services Managers
- 1341 Child Care Services Managers
- 1342 Health Services Managers

1343	Aged Care Services Managers
1344	Social Welfare Managers
1345	Education Managers
1346	Financial and Insurance Services Branch Managers
1349	Professional Services Managers Not Elsewhere Classified
1411	Hotel Managers
1412	Restaurant Managers
1420	Retail and Wholesale Trade Managers
1431	Sports, Recreation and Cultural Centre Managers
1439	Services Managers Not Elsewhere Classified
2111	Physicists and Astronomers
2112	Meteorologists
2113	Chemists
2114	Geologists and Geophysicists
2120	Mathematicians, Actuaries and Statisticians
2131	Biologists, Botanists, Zoologists and Related Professionals
2132	Farming, Forestry and Fisheries Advisers
2133	Environmental Protection Professionals
2141	Industrial and Production Engineers
2142	Civil Engineers
2143	Environmental Engineers
2144	Mechanical Engineers
2145	Chemical Engineers
2146	Mining Engineers, Metallurgists and Related Professionals
2149	Engineering Professionals Not Elsewhere Classified

2151	Electrical Engineers
2152	Electronic Engineers
2153	Telecommunications Engineers
2161	Building Architects
2162	Landscape Architects
2163	Product and Garment Designers
2164	Town and Traffic Planners
2165	Cartographers and Surveyors
2166	Graphic and Multimedia Designers
2211	Generalist Medical Practitioners
2212	Specialist Medical Practitioners
2221	Nursing Professionals
2222	Midwifery Professionals
2230	Traditional and Complementary Medicine Professionals
2240	Paramedical Practitioners
2250	Veterinarians
2261	Dentists
2262	Pharmacists
2263	Environmental and Occupational Health and Hygiene Professionals
2264	Physiotherapists
2265	Dieticians and Nutritionists
2266	Audiologists and Speech Therapists
2267	Optometrists and Ophthalmic Opticians
2269	Health Professionals Not Elsewhere Classified
2310	University and Higher Education Teachers

2320	Vocational Education Teachers
2330	Secondary Education Teachers
2341	Primary School Teachers
2342	Early Childhood Educators
2351	Education Methods specialists
2352	Special Needs Teachers
2353	Other Language Teachers
2354	Other Music Teachers
2355	Other Arts Teachers
2356	Information Technology Trainers
2359	Teaching Professionals Not Elsewhere Classified
2411	Accountants
2412	Financial and Investment Advisers
2413	Financial Analysts
2421	Management and Organization Analysts
2422	Policy Administration Professionals
2423	Personnel and Careers Professionals
2424	Training and Staff Development Professionals
2431	Advertising and Marketing Professionals
2432	Public Relations Professionals
2433	Technical and Medical Sales Professionals (excluding ICT)
2434	Information and Communications Technology Sales Professionals
2511	Systems Analysts
2512	Software Developers
2513	Web and Multimedia Developers

2514	Applications Programmers
2519	Software and Applications Developers and Analysts Not Elsewhere Classified
2521	Database Designers and Administrators
2522	Systems Administrators
2523	Computer Network Professionals
2529	Database and Network Professionals Not Elsewhere Classified
2611	Lawyers
2612	Judges
2619	Legal Professionals Not Elsewhere Classified
2621	Archivists and Curators
2622	Librarians and Related Information Professionals
2631	Economists
2632	Sociologists, Anthropologists and Related Professionals
2633	Philosophers, Historians and Political Scientists
2634	Psychologists
2635	Social Work and Counselling Professionals
2636	Religious Professionals
2641	Authors and Related Writers
2642	Journalists
2643	Translators, Interpreters and Other Linguists
2651	Visual Artists
2652	Musicians, Singers and Composers
2653	Dancers and Choreographers
2654	Film, Stage and Related Directors and Producers
2655	Actors

2656	Announcers on Radio, Television and Other Media
2659	Creative and Performing Artists Not Elsewhere Classified
3111	Chemical and Physical Science Technicians
3112	Civil Engineering Technicians
3113	Electrical Engineering Technicians
3114	Electronic Engineering Technicians
3115	Mechanical Engineering Technicians
3116	Chemical Engineering Technicians
3117	Mining and Metallurgical Technicians
3118	Draughtspersons
3119	Physical and Engineering Science Technicians Not Elsewhere Classified
3121	Mining Supervisors
3122	Manufacturing Supervisors
3123	Construction Supervisors
3131	Power Production Plant Operators
3132	Incinerator and Water Treatment Plant Operators
3133	Chemical Processing Plant Controllers
3134	Petroleum and Natural Gas Refining Plant Operators
3135	Metal Production Process Controllers
3139	Process Control Technicians Not Elsewhere Classified
3141	Life Science Technicians (excluding Medical)
3142	Agricultural Technicians
3143	Forestry Technicians
3151	Ships' Engineers
3152	Ships' Deck Officers and Pilots

3153	Aircraft Pilots and Related Associate Professionals
3154	Air Traffic Controllers
3155	Air Traffic Safety Electronic Technicians
3211	Medical Imaging and Therapeutic Equipment Technicians
3212	Medical and Pathology Laboratory Technicians
3213	Pharmaceutical Technicians and Assistants
3214	Medical and Dental Prosthetic Technicians
3221	Nursing Associate Professionals
3222	Midwifery Associate Professionals
3230	Traditional and Complementary Medicine Associate Professionals
3240	Veterinary Technicians and Assistants
3251	Dental Assistants and Therapists
3252	Medical Records and Health Information Technicians
3253	Community Health Workers
3254	Dispensing Opticians
3255	Physiotherapy Technicians and Assistants
3256	Medical Assistants
3257	Environmental and Occupational Health Inspectors and Associates
3258	Ambulance Workers
3259	Health Associate Professionals Not Elsewhere Classified
3311	Securities and Finance Dealers and Brokers
3312	Credit and Loans Officers
3313	Accounting Associate Professionals
3314	Statistical, Mathematical and Related Associate Professionals
3315	Valuers and Loss Assessors

3321	Insurance Representatives
3322	Commercial Sales Representatives
3323	Buyers
3324	Trade Brokers
3331	Clearing and Forwarding Agents
3332	Conference and Event Planners
3333	Employment Agents and Contractors
3334	Real Estate Agents and Property Managers
3339	Business Services Agents Not Elsewhere Classified
3341	Office Supervisors
3342	Legal Secretaries
3343	Administrative and Executive Secretaries
3344	Medical Secretaries
3351	Customs and Border Inspectors
3352	Government Tax and Excise Officials
3353	Government Social Benefits Officials
3354	Government Licensing Officials
3355	Police Inspectors and Detectives
3359	Government Regulatory Associate Professionals Not Elsewhere Classified
3411	Legal and Related Associate Professionals
3412	Social Work Associate Professionals
3413	Religious Associate Professionals
3421	Athletes and Sports Players
3422	Sports Coaches, Instructors and Officials
3423	Fitness and Recreation Instructors and Programme Leaders



3431	Photographers
3432	Interior Designers and Decorators
3433	Gallery, Museum and Library Technicians
3434	Chefs
3435	Other Artistic and Cultural Associate Professionals
3511	Information and Communications Technology Operations Technicians
3512	Information and Communications Technology User Support Technicians
3513	Computer Network and Systems Technicians
3514	Web Technicians
3521	Broadcasting and Audiovisual Technicians
3522	Telecommunications Engineering Technicians
4110	General Office Clerks
4120	Secretaries (general)
4131	Typists and Word Processing Operators
4132	Data Entry Clerks
4211	Bank Tellers and Related Clerks
4212	Bookmakers, Croupiers and Related Gaming Workers
4213	Pawnbrokers and Money-lenders
4214	Debt Collectors and Related Workers
4221	Travel Consultants and Clerks
4222	Contact Centre Information Clerks
4223	Telephone Switchboard Operators
4224	Hotel Receptionists
4225	Inquiry Clerks
4226	Receptionists (general)

4227	Survey and Market Research Interviewers
4229	Client Information Workers Not Elsewhere Classified
4311	Accounting and Bookkeeping Clerks
4312	Statistical, Finance and Insurance Clerks
4313	Payroll Clerks
4321	Stock Clerks
4322	Production Clerks
4323	Transport Clerks
4411	Library Clerks
4412	Mail Carriers and Sorting Clerks
4413	Coding, Proofreading and Related Clerks
4414	Scribes and Related Workers
4415	Filing and Copying Clerks
4416	Personnel Clerks
4419	Clerical Support Workers Not Elsewhere Classified
5111	Travel Attendants and Travel Stewards
5112	Transport Conductors
5113	Travel Guides
5120	Cooks
5131	Waiters
5132	Bartenders
5141	Hairdressers
5142	Beauticians and Related Workers
5151	Cleaning and Housekeeping Supervisors in Offices, Hotels and Other Establishments
5152	Domestic Housekeepers

5153	Building Caretakers
5161	Astrologers, Fortune-tellers and Related Workers
5162	Companions and Valets
5163	Undertakers and Embalmers
5164	Pet Groomers and Animal Care Workers
5165	Driving Instructors
5169	Personal Services Workers Not Elsewhere Classified
5211	Stall and Market Salespersons
5212	Street Food Salespersons
5221	Shopkeepers
5222	Shop Supervisors
5223	Shop Sales Assistants
5230	Cashiers and Ticket Clerks
5241	Fashion and Other Models
5242	Sales Demonstrators
5243	Door-to-door Salespersons
5244	Contact Centre Salespersons
5245	Service Station Attendants
5246	Food Service Counter Attendants
5249	Sales Workers Not Elsewhere Classified
5311	Child Care Workers
5312	Teachers' Aides
5321	Health Care Assistants
5322	Home-based Personal Care Workers
5329	Personal Care Workers in Health Services Not Elsewhere Classified

5411	Firefighters
5412	Police Officers
5413	Prison Guards
5414	Security Guards
5419	Protective Services Workers Not Elsewhere Classified
6111	Field Crop and Vegetable Growers
6112	Tree and Shrub Crop Growers
6113	Gardeners; Horticultural and Nursery Growers
6114	Mixed Crop Growers
6121	Livestock and Dairy Producers
6122	Poultry Producers
6123	Apiarists and Sericulturists
6129	Animal Producers Not Elsewhere Classified
6130	Mixed Crop and Animal Producers
6210	Forestry and Related Workers
6221	Aquaculture Workers
6222	Inland and Coastal Waters Fishery Workers
6223	Deep-sea Fishery Workers
6224	Hunters and Trappers
6310	Subsistence Crop Farmers
6320	Subsistence Livestock Farmers
6330	Subsistence Mixed Crop and Livestock Farmers
6340	Subsistence Fishers, Hunters, Trappers and Gatherers
7111	House Builders
7112	Bricklayers and Related Workers

7113	Stonemasons, Stone Cutters, Splitters and Carvers
7114	Concrete Placers, Concrete Finishers and Related Workers
7115	Carpenters and Joiners
7119	Building Frame and Related Trades Workers Not Elsewhere Classified
7121	Roofers
7122	Floor Layers and Tile Setters
7123	Plasterers
7124	Insulation Workers
7125	Glaziers
7126	Plumbers and Pipe Fitters
7127	Air Conditioning and Refrigeration Mechanics
7131	Painters and Related Workers
7132	Spray Painters and Varnishers
7133	Building Structure Cleaners
7211	Metal Moulders and Coremakers
7212	Welders and Flame Cutters
7213	Sheet Metal Workers
7214	Structural Metal Preparers and Erectors
7215	Riggers and Cable Splicers
7221	Blacksmiths, Hammersmiths and Forging Press Workers
7222	Toolmakers and Related Workers
7223	Metal Working Machine Tool Setters and Operators
7224	Metal Polishers, Wheel Grinders and Tool Sharpeners
7231	Motor Vehicle Mechanics and Repairers
7232	Aircraft Engine Mechanics and Repairers

7233	Agricultural and Industrial Machinery Mechanics and Repairers
7234	Bicycle and Related Repairers
7311	Precision-instrument Makers and Repairers
7312	Musical Instrument Makers and Tuners
7313	Jewellery and Precious Metal Workers
7314	Potters and Related Workers
7315	Glass Makers, Cutters, Grinders and Finishers
7316	Signwriters, Decorative Painters, Engravers and Etchers
7317	Handicraft Workers in Wood, Basketry and Related Materials
7318	Handicraft Workers in Textile, Leather and Related Materials
7319	Handicraft Workers Not Elsewhere Classified
7321	Pre-press Technicians
7322	Printers
7323	Print Finishing and Binding Workers
7411	Building and Related Electricians
7412	Electrical Mechanics and Fitters
7413	Electrical Line Installers and Repairers
7421	Electronic Mechanics and Servicers
7422	Information and Communications Technology Installers and Servicers
7511	Butchers, Fishmongers and Related Food Preparers
7512	Bakers, Pastry-cooks and Confectionery Makers
7513	Dairy Products Makers
7514	Fruit, Vegetable and Related Preservers
7515	Food and Beverage Tasters and Graders
7516	Tobacco Preparers and Tobacco Products Makers

7521	Wood Treaters
7522	Cabinet-makers and Related Workers
7523	Woodworking Machine Tool Setters and Operators
7531	Tailors, Dressmakers, Furriers and Hatters
7532	Garment and Related Patternmakers and Cutters
7533	Sewing, Embroidery and Related Workers
7534	Upholsterers and Related Workers
7535	Pelt Dressers, Tanners and Fellmongers
7536	Shoemakers and Related Workers
7541	Underwater Divers
7542	Shotfirers and Blasters
7543	Product Graders and Testers (excluding Foods and Beverages)
7544	Fumigators and Other Pest and Weed Controllers
7549	Craft and Related Workers Not Elsewhere Classified
8111	Miners and Quarriers
8112	Mineral and Stone Processing Plant Operators
8113	Well Drillers and Borers and Related Workers
8114	Cement, Stone and Other Mineral Products Machine Operators
8121	Metal Processing Plant Operators
8122	Metal Finishing, Plating and Coating Machine Operators
8131	Chemical Products Plant and Machine Operators
8132	Photographic Products Machine Operators
8141	Rubber Products Machine Operators
8142	Plastic Products Machine Operators
8143	Paper Products Machine Operators

8151	Fibre Preparing, Spinning and Winding Machine Operators
8152	Weaving and Knitting Machine Operators
8153	Sewing Machine Operators
8154	Bleaching, Dyeing and Fabric Cleaning Machine Operators
8155	Fur and Leather Preparing Machine Operators
8156	Shoemaking and Related Machine Operators
8157	Laundry Machine Operators
8159	Textile, Fur and Leather Products Machine Operators Not Elsewhere Classified
8160	Food and Related Products Machine Operators
8171	Pulp and Papermaking Plant Operators
8172	Wood Processing Plant Operators
8181	Glass and Ceramics Plant Operators
8182	Steam Engine and Boiler Operators
8183	Packing, Bottling and Labelling Machine Operators
8189	Stationary Plant and Machine Operators Not Elsewhere Classified
8211	Mechanical Machinery Assemblers
8212	Electrical and Electronic Equipment Assemblers
8219	Assemblers Not Elsewhere Classified
8311	Locomotive Engine Drivers
8312	Railway Brake, Signal and Switch Operators
8321	Motorcycle Drivers
8322	Car, Taxi and Van Drivers
8331	Bus and Tram Drivers
8332	Heavy Truck and Lorry Drivers
8341	Mobile Farm and Forestry Plant Operators



8342	Earthmoving and Related Plant Operators
8343	Crane, Hoist and Related Plant Operators
8344	Lifting Truck Operators
8350	Ships' Deck Crews and Related Workers
9111	Domestic Cleaners and Helpers
9112	Cleaners and Helpers in Offices, Hotels and Other Establishments
9121	Hand Launderers and Pressers
9122	Vehicle Cleaners
9123	Window Cleaners
9129	Other Cleaning Workers
9211	Crop Farm Labourers
9212	Livestock Farm Labourers
9213	Mixed Crop and Livestock Farm Labourers
9214	Garden and Horticultural Labourers
9215	Forestry Labourers
9216	Fishery and Aquaculture Labourers
9311	Mining and Quarrying Labourers
9312	Civil Engineering Labourers
9313	Building Construction Labourers
9321	Hand Packers
9329	Manufacturing Labourers Not Elsewhere Classified
9331	Hand and Pedal Vehicle Drivers
9332	Drivers of Animal-drawn Vehicles and Machinery
9333	Freight Handlers
9334	Shelf Fillers

9411	Fast Food Preparers
9412	Kitchen Helpers
9510	Street and Related Services Workers
9520	Street Vendors (excluding Food)
9611	Garbage and Recycling Collectors
9612	Refuse Sorters
9613	Sweepers and Related Labourers
9621	Messengers, Package Deliverers and Luggage Porters
9622	Odd-job Persons
9623	Meter Readers and Vending-machine Collectors
9624	Water and Firewood Collectors
9629	Elementary Workers Not Elsewhere Classified

Q004 - VBF: Task matrix

Matrix

Not back | Number of rows: 1 | Number of columns: 5

Based on the most recent technological developments (e.g., in the fields of robotics, computerization, machine learning), could you indicate how much time workers will spend on the following tasks for the occupation of [INSERT ANSWER Q003] in the next five years?

Please take into account factors that influence the actual adoption of technologies when providing your answer (i.e., the price of technologies; the design of the organisation, production processes and supply chains; legal constraints; and cultural expectations).

Rows: Random | Columns: Normal

Rendered as Dynamic Grid

	Workers will not perform this task any longer	Workers will spend less time on this task	Workers will spend the same amount of time on this task	Workers will spend more time on this task	I don't know
[INSERT FROM EXCEL]	?	?	?	?	?

B001 - BBB: Occupation selection	End block
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B003 - BBD: Robot/ AI statements	Begin block
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Q006 - VBH: Robot/AI statements

Matrix

Not back | Number of rows: 2 | Number of columns: 5

To what extent do you agree or disagree with each of the following statements?

Rows: Random | Columns: Normal

Rendered as Dynamic Grid

	Totally agree	Tend to agree	Tend to disagree	Totally disagree	I don't know
Due to the use of robots and artificial intelligence, more jobs will disappear than new jobs will be created	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Robots are necessary as they can do jobs that are too hard or too dangerous for people	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

  

B003 - BBD: Robot/ AI statements	End block
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